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## ABSTRACTS

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(Pages refer to the Japanese originals of this volume unless otherwise noticed)

### The Determination of Carbonic Acid Contained in Solid Substances.

(pp. 135~139)

By Yosaburo IWASA and Kunitaro IWAMOTO.

(Dept. of Food Chemistry Osaka Municipal Hyg. Lab. Received Nov. 18, 1937.)

(1) The authors have perfected a method on the determination of carbonic acid contained in solid substances, improving on the method designed by Pettenkofer. Namely, we have improved an air-collected bottle, together with the methods and etc. involved in the determination of carbonic acid in air.

(2) The results obtained in experiments using this new method were good. In separating 45.2638 mg of  $\text{CO}_2$  from 75.5 mg of  $\text{CaCO}_3$ , the result measured inside the error of 0.3 mg.

(3) These designed experiments were repeated 10 times, using about 5 mg, 10 mg, 100 mg of  $\text{CaCO}_3$  and the standard deviation was determined.

(4) The gravimetric determination of carbonic acid by Fresenius-Classen method was repeated 10 times using, also, 5 mg, 10 mg, 100 mg of  $\text{CaCO}_3$  and the standard deviation was measured.

(5) After comparing the results obtained in the two above mentioned experiments, we inferred that our designed method was better than that of Fresenius-Classen and that the results were perfectly satisfactory.

### Studies on Ascorbic Acid Oxidase. I.

(pp. 140~148)

By Nobuo ITO.

(From the Agr. Chemical Laboratory, Hokkaido Imp. Univ., Sapporo, Japan. Received Nov. 18, 1937.)

27 species of vegetables and fruits were examined concerning the existence

of ascorbic acid oxidase in the 30% alcohol extracts. Carrot, potato, burdock, squash, cucumber, muskmelon, oriental pickling melon, Japanese melon (makuwauri), soy-bean, azuki-bean, cow-pea, egg-plant, pear, loquat and cabbage were powerful on the enzymic activity; sweet potato, water-melon and Japanese apricot were weak, while radish, turnip, pumpkin, onion, pea, cherry, grape, and gooseberry were negative. The occurrence of the enzyme is not correlated to the amount of ascorbic acid in the same plant and the reason for such distribution of the enzyme is incomprehensible from the taxonomical or ecological point of view.

From the fact that onion, welsh onion and radish were negative on the enzymic function, the author supposed the relation of the enzymic oxidation to the sulphur compounds, especially to allyl sulphide, which are contained in these vegetables. The juice from onion, however, did not inhibit at all the enzymic oxidation of ascorbic acid in the reaction mixture containing the alcohol extract of potato or the enzyme preparation from cucumber, but the oxidation by copper a little. This result does not agree with author's supposition and the further investigations on the behaviour of allyl sulphide and the other sulphur compounds in higher concentration are remained in future.

The inhibitory effect of metaphosphoric acid or oxalic acid on the enzymic oxidation of ascorbic acid was compared and shown that oxalic acid was more effective, then it will be possible to use the acid for the extraction and the estimation of ascorbic acid.

The oxidation of ascorbic acid was accelerated by Cu + gelation or Cu + ovoalbumin, but not by Cu + peptone. The former mixtures lost the action by heating, as Stotz and the co-workers reported recently. The optimum pH of Cu + gelatin for the action was pH 4.1~4.8, Cu + ovoalbumin pH 4.8, while that of the enzyme preparation from cucumber was pH 6.0. Moreover, it was noticed that the intensity of the oxidation by the mixture of copper and protein was generally weaker than the enzyme. The problem whether the "ascorbic acid oxidase" is a mixture of copper and albumin or not, should be studied further, and this solution will give a suggestion for the chemistry of the nature of all enzymes.

### Alcohol Manufacture from Potato. (Part IV).

On the Preparing of Alcohol-mash by the Method of

Acid-hydrolysis of Potato. (II).

(pp. 149~158)

H. OKADA, S. KASHIWABARA, and T. SUGIYAMA.

(The Hokkaido Industrial Experiment Station. Received Oct. 28, 1937.)

In this paper experiments are described concerning the saccharification of the dried potato pulp using sulphuric acid. It is prepared from potato by rotatory kiln-dryer after the removal of 40% of potatoes as juice by pressing. The moisture

content of the dried potato pulp is reduced to 11.19%. As a result of our works it is shown that the dried potato pulp requires a smaller amount of acid for the saccharification than the crushed non-pressed potato but a larger amount of acid than the pressed non-dried potato. The experimental results were summarized as follows :

(1) The reducing substance is, at best, obtainable with a yield of about 90 % of the starch after 3 hours at 4 atm. pressure using sulfuric acid (sp. gr., 1.84) 0.6% by weight on the dried potato pulp, (the acid amount corresponds to about 3.5% on the starch contained), which is added with treble amounts of water. At a lower pressure 3.0 atm. the yield of the reducing substance is, similarly as before, equivalent to about 90% of the starch after 3 hr.-saccharification even using an increased amount of the acid 0.75% on the material to be saccharified (about 4.6 % sulfuric acid on the starch). In these cases, that is to say, the conditions for the saccharification such as the amounts of the acid used and the pressure supplied are probably deficient. At an increased pressure 3.5 atm. using 0.75% sulfuric acid on the material it is possible to obtain 81.6% reducing substance after 1 hr.-saccharification and 98.0% or more after 2 hours. It may, therefore, be sure to obtain a sufficient saccharification within 1 hour using a little more acid.

(2) Practically it is somewhat trouble to saccharify the pulp which is prepared from the dried potato pulp by pressing it after steeping in 1.5 or 2.0 times amounts of water for some hours. But according to the procedure mentioned above, it is found possible that the consumption of the acid is only greatly saved, but also the velocity of the saccharification is remarkably accelerated.

(3) Attempt is made to prepare a highly concentrated sugar containing solution either from the raw pressed potato or from the dried potato pulp. And it is confirmed possible to obtain an about 25 or 35% reducing substance containing solution from both materials with a yield of 99% after 1 or 1.5 hr.-saccharification. In these case, the acid-supplies are equivalent to 3.46% on the starch in the non-dried potato pulp and 4.32% on that in the dried potato pulp at the same pressure 3.5 atm. The above described process facilitates remarkably the saccharification and renders the pressed juice in the pulp preparation available to the fermentation.

(4) A few volatile substances are qualitatively examined which are found in the saccharified solutions either of the raw potato pulp or of the dried potato pulp using sulfuric or hydrochloric acid. Furfurol, glyoxylic acid, levulinic acid and formic acid can be detected. Then, furfural and formic acid are examined in respect to their effects on the fermentation of the Hayduck-solution (glucose) by Rasse XII, as they are thought the most harmful among them. As a result of our investigations it can be stated with certainty that amounts of these substances, which are produced in our saccharification process, are too small to give harmful effects on the fermentation.

## Sterilizing Action of Acids. XIth. Report.

The total summary and the total conclusion on the sterilizing action of mineral acids and fatty acids.  
 (pp. 159~164)

By Sogo TETSUMOTO.

(The Government Institute for Infectious Diseases, Tokyo  
 Imperial University. Received Nov. 5, 1937.)

By the systematic studying of mineral acids and fatty acids and their salts on the physiology of bacteria, we obtain the next conclusion.

### I. The influence of mineral acids on bacterial physiogy is as follows.

(1) The original cause of the sterilizing action of strong mineral acids is the reducing action by dissociated H ion of acids, and then if the pH of acids are the same, then the sterilizing action is quite equal notwithstanding the difference of kind of acids.

(2) Concerning the sterilizing action of the weak mineral acids, we see two types:-

i) The cause of the sterilizing action of cyanic acid, boric acid and very dilute solution of osmic acid is due to the toxic action for bacterial protoplasm.

ii) The cause of the sterilizing action of osmic acid and cromic acid is due to the oxidizing action of their acid anions on the bacterial protoplasm.

### II. The influence of fatty acids on bacterial physiology is very complex.

(1) We see special relation between the number of C atom of fatty acids and the sterilizing or promoting action on bacteria.

When the number of C atom is within 6~8, the sterilizing action of each fatty acid, is chiefly due to the reducing action by pH, and then when the number of C atom is 8~11, the sterilizing action of each acid is chiefly due to the poisoning action of undissociated molecule of each acid to bacterial body.

Each acid of  $C_{14} \sim C_{18}$ , has no bactericidal or bacteristatic action, but has rather promoting action for the life of microorganisms.

(2) When halogen atoms, aldehyde group, or carbonyl groups combine to alkyl groups respectively, then the poisoning action or reducing action of acids increases. Accordingly, the sterilizing action of fatty acids increase.

(3) There seems inverse relation lies between the number of  $CO_2H$  group and the strength of sterilizing power of fatty acids.

(4) We see no relation between the number of (OH) group and the strength of sterilizing action.

(5) We find the special relation between the chemical constitution of fatty acids and physiology of bacteria.

i) Normal fatty acids have the stronger sterilizing action than isomers.

ii) Cis fatty acids have the stronger bactericidal or bacteristatic action than trans fatty acids, and trans fatty acids have the stronger promoting action than cis fatty acids.

Such difference are due to difference in the stereochemical constitution of these fatty acids.

Namely, in the case of dibasic fatty acids, cis fatty acids have CO<sub>2</sub>H group or H atom at the same side in their stereochemical constitution. Dissociated H ions of cis fatty acids are absorbed more and have the stronger reducing action on the bacterial protoplasm than trans acids.

Accordingly, cis dibasic fatty acids have the stronger sterilizing action than trans fatty acids, and cis monobasic fatty acids have CO<sub>2</sub>H group or H ion at the same side as already mentioned in the case of dibasic fatty acids.

Owing to this, cis acids have the greater dissociation degree and are absorbed more on the bacterial protoplasm than trans fatty acids.

Accordingly, trans fatty acids exist mostly in a harmless molecular state for the bacterial physiology and also have the action to prevent the great change of osmotic pressure of bacterial body. In the preventing action on the change of osmotic pressure in the bacterial protoplasm, trans fatty acids are superior to cis fatty acids.

iii) Judging from the effects of the three kinds of optically active fatty acids, such as lactic acids, malic acids and tartaric acids, on the physiology of bacteria, we could ascertain that optically active fatty acids having the stereochemical constitution, show not only optically active property, but also the stronger action on the physiology of bacteria than optically inactive fatty acids. Optically active fatty acid salts have the more promoting action for the bacterial life than optically inactive fatty acid salts. *d* and *l* optically active fatty acid salts have the same promoting action on the bacterial life and their action is stronger than that of *r* and *m* acid salts. Salts of *r* and *m* acid isomers have the nearly equal promoting action.

In short, lactic acid, malic acid and tartaric acids having optically active property, have not only the specific rotatory action physically but also the stronger bactericidal action or promoting action on the bacterial life.

### On the Method of Determination of pH of Soil under Natural Field Condition.

(pp. 165~177)

By M. AOKI.

(Kyoto Imperial University. Received Nov. 18, 1937.)

In order to compare the accuracy of the method of pH determination of soil under natural field condition, the present author conducted pH determination of 23 soils by the so-called field method (A-type) by H. J. Verwell and by the new electrode (B-type) devised by Dr. A. Itano and compared the results with those of usual Quinhydrone method.

The results are summarized as follows:-

(1) pH value of soil suspension determined by B-type electrode was usually a little higher or lower than that by usual Quinhydrone method, but sometimes a marked difference was obtained on some soils.

(2) For the most soils studied, a remarkable change in E. M. F. was observed within 2 minutes after the insertion of electrode into soil or soil suspension.

(3) It was found that there was no regular relation between pH value and moisture content of soil.

(4) Greater variation of pH value of soil within small area (15 cm dia.) was obtained by Itano's electrode (B-type) than that by usual Quinhydrone method.

### On the Fixation of Sericin of Raw Silk. (Part II).

Fixation of sericin powder by chromium salts.

(pp. 178~186)

By Masami OKU and Zirō HIROSE.

(From the Chemical Laboratory of Gunze Raw Silk Mfg. Co. Ltd.,  
Ayabe-mati, Kyōto-hu; Received December 20, 1937.)

In this paper we studied the fixation of  $\alpha$ - and  $\beta$ -sericin powder, which were prepared from the raw cocoon layers, by treating with basic chromium sulphate (which has cathionic chromium complex) and basic oxalato-chromiate (which has anionic chromium complex) respectively. Thus the modes of adsorption of chromium and sulphate ions, as the results of which caused the increase of water stability of sericin, were studied precisely. But in this and later reports we mean  $\alpha$ -sericin by one which can be obtained as precipitates when making pH of the sericin sol 3.8 and  $\beta$ -sericin by one which can be obtained as precipitates from the filtrate of  $\alpha$ -sericin by increasing the conc. of alcohol up to 50%, adding ethyl alcohol to the filtrate.

The experimental results were summarised as follows;

1) Combination of sericin ( $\alpha$ -,  $\beta$ -) with  $\text{Cr}_2\text{O}_3$  and  $\text{SO}_4$ , respectively occur as true adsorption phenomenon, following the formula of Freundlich's adsorption isotherm.

2)  $\beta$ -sericin takes up more  $\text{Cr}_2\text{O}_3$  and minor  $\text{SO}_4$  than  $\alpha$ -sericin when treated in the basic chromium sulphate bath of the same concentration which has cathionic chromium complexes. In the case of basic oxalatochromiate bath which contains anionic chromium complexes  $\alpha$ -sericin takes up more anionic chromium and minor  $\text{SO}_4$  than  $\beta$ -sericin. We can therefore conclude that  $\alpha$ -sericin takes up more anions and minor cathions than  $\beta$ -sericin.

3)  $\alpha$ -sericin becomes much more water stable than  $\beta$ -sericin when treated with basic chromium salts but keeping in mind the higher water stability of the original  $\alpha$ -sericin, degree of fixation of  $\beta$ -sericin is much more facilitated than  $\alpha$ -sericin through chromination.

4) Fixation of sericin by treatment with chromate complexes is much more effective than that by chromiate complexes.

5) Sericin isolated from the cocoon layers adsorbs minor amount of chromium and sulphate than that which is retained on the same raw silk fibres. Even when the amount of chromium taken up by sericin is the same, water insolubility of the powdered chrome-sericinate is always smaller than in the case of native sericin on the fibres. Perhaps, there may exist some differences of mode of chromium-sericin combination between both cases.

### **Studies on Micro-methods for the Chemical Analysis of Water. III.**

A new portable colorimeter.

(pp. 187~197)

By Tetuo TOMIYAMA and Minoru WATANABE.

(The Imperial Fisheries Institute, Tokio. Received Oct. 21, 1937.)

Descriptions have been made on a new simple portable colorimeter. The following points may be mentioned as its characteristics: (1) only 40 cc sample is needed for estimations, (2) having two sets of colorimeter tube, each consisting of a pair of an outer and an inner tube, it is easy to eliminate the difficulty met by inherent color or turbidity of the sample water, (3) the two sets of colorimeter tube do not run parallel but a little inclined so that the color comparison may be made by one sight, (4) pH determination can be carried out by Gillespie method, (5) adopting Martiny's procedure all colorimetric methods may be carried out without using distilled water. In the field works, accordingly, the colorimeter is very convenient to carry out the colorimetric analysis. The accuracy of the procedure has been studied in detail.

### **Composition of Jerusalem Artichokes and its Inulase.**

(pp. 198~209)

By Toshinobu ASAI.

(Agricultural Chemical Laboratory, Morioka Agricultural College, Japan. Received Nov. 4, 1937.)

### **Action of a Green Fluorescent Substance Like Acetyl Flavin on Plants and Animals. (Part I).**

(pp. 210~213)

By Tetutaro TADOKORO and Tuneyuki SAITO.

(Hokkaido Imperial University, Japan. Received Nov. 4, 1937.)

## On the Contents of 0.2N HCl Soluble Phosphoric Acid of Tyōsen Soils (IV).

By Dr. Misu HIDEO.

(Chemical Department, Agricultural Experiment Station of Government General of Tyōsen. Received, Nov. 10, 1937.)

## Effects of Some Substances in the Extracts of Rice Polishings and Beef Liver on Pellagra-like Symptoms of Rats due to High-Sucrose Diet.

(pp. 226~235)

By Ume TANGE.

(The Institute of Physical and Chemical Research. Received August 13, 1937.)

### PART I.

In the study of the vitamin B<sub>2</sub> complex, the carbohydrate constituent of the basal ration has received much attention. Bender et al. demonstrated protection from dermatitis and increased growth with dextrin rather than sucrose in the diet. Chick and coworkers reported a more regular incidence of dermatitis when maize sugar replaced starch.

For comparative studies concerning the effects of some substances in the extracts of rice polishings and beef liver upon the dermatitis of rats caused by a dietary deficiency, the lack of vitamin B<sub>6</sub> named by György, sucrose and dextrin were used as the carbohydrate source of the basal ration, which consisted of:

#### A. Sucrose ration.

Purified fish protein	18%
Sucrose (pharmacopeia Japonica)	64%
Crisco	3%
McCollum salt	5%
Agar-agar	2%
Dried egg white (as flavin)	8%

#### B. Dextrin ration.

Purified fish protein	18%
Dextrin (potato or corn starch)	66%
Crisco	3%
McCollum salt	5%
Dried egg white (as flavin)	8%

Each group of A and B rations was daily supplemented with 10% of crystalline vitamin B<sub>1</sub> and one drop of cod liver oil (pharmacopeia Japonica).

Preparation of antidermatitic factor from rice polishings—Oryzanin extract\* was used as the starting material, and extracted carefully with 85~88% alcohol

\* Thick syrup of rice polishings extract prepared in Sankyo Company, Tokyo.

several times to remove sugar contained in the extract. The alcohol extracts were evaporated to expel off the alcohol, added water, acidified with sulphuric acid to pH 2.5, and then treated with acid clay in the usual manner.

The acid earth adsorbate and its eluate, which eluted with either  $\text{Ba}(\text{OH})_2$  or  $\text{NaOH}$ , each supplementing sucrose diet at the level equal to 1 g of oryzanin extract were tested on the rats.

Concentration of beef liver extract—The beef liver powder, which dried at about  $70^\circ\text{C}$  and extracted with ether, was digested with papain. After separating the papain solution from residue, the latter was extracted thoroughly with 80~90% alcohol, and the alcohol extracts were evaporated in vacuo. This was then combined with the papain solution, and concentrated under reduced pressure to a convenient volume (Fraction A). It was now acidified with conc. hydrochloric acid to pH 2, and then treated with acid clay as above. The filtrates from acid earth adsorbates were neutralized with  $\text{NaOH}$ , added 90% alcohol, and  $\text{NaCl}$  and inert material were allowed to settle out. After removing the precipitates, the solution was concentrated in vacuo so that 1 cc equal to 1 g of the original beef liver powder.

The experimental results are summarized as follows:

1. A high incidence of dermatitis in rats when using sucrose rather than using dextrin in diet was observed.
2. The pellagra-like symptoms of rats were protected and cured with acid clay adsorbate as well as its eluate of rice polishings extracts, at the level equivalent to 1 g of oryzanin extract.
3. The properties of the antidermatitic factor in rice polishings extracts resembled those of  $\text{B}_6$  described by György, namely the active substance was not precipitated by lead acetate, but precipitated from acid solution by phosphotungstic acid, etc.
4. Rats receiving vitamin  $\text{B}_1$ , flavin and vitamin  $\text{B}_6$  (antidermatitic factor in rice polishings extracts) did not attain normal growth though no dermatitic symptoms appeared.
5. In the above case, if  $\text{B}_6$  was replaced by the liver filtrate the rats were growing for some periods in spite of developing dermatitic symptoms, probably due to the lack of  $\text{B}_6$ . There was in every case a better growth when the earth adsorbate of rice polishings extracts and liver filtrate were fed in combination.

## PART II.

The phenomena described in 4 and 5 of the summary mentioned above, called the author's attention to determine the properties of liver extract.

As the preliminary work on the liver growth factor the following the following procedure was used:

- a. Concentration of the factor from liver extract—Fraction A of liver extract was diluted with water, and a mixture of alcohol and ether was added with con-

stant stirring. The precipitate was allowed to settle out and the supernatant liquid decanted. The precipitate was dissolved in water and reprecipitated. After being washed with an alcohol-ether mixture the precipitate was dissolved in water and allowed to stand in the ice box. Removing the inert matter, the combined filtrate and washings were concentrated in vacuo.

b. The basal ration consisting of: Purified fish protein 17, dextrinized corn starch 54, McCollum salt 4, Crisco 5, white corn 15, and dried egg white (as flavin) 5 was used as this ration has been found to furnish all the known vitamin B complex when supplied with vitamin B<sub>1</sub>. Besides one drop of cod liver oil was administered daily.

The experimental results are as follows: The rats given the diet supplemented with vitamin B<sub>1</sub> failed to grow without developing any type of lesions, but those administered daily with 0.5 cc of alcohol-ether precipitate equal to 1 g of Fraction A showed rapid growth. By adding 5% Fraction A to the basal diet, an excellent growth response was resulted.

(Further studies of the growth factor is in progress).

### Feeding Experiments with Decomposition Products of Proteins. (V).

On the nutritive Value of some Protein Derivatives and partial Decomposition Products.

(pp. 236~241)  
By Siro MAEDA.

(The Institute of Physical and Chemical Research)

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#### Part II

Concentrations of the solvent from 10% to 40% of the ammonia solution were used.

At the preliminary stage no effect was observed on the rat growth after the following treatment:

a. Concentration of the solvent from 10% to 40% of the ammonia solution was used.